



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 1 022 731 A3**

(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:
04.04.2001 Bulletin 2001/14

(51) Int. Cl.⁷: **G11B 7/135**

(43) Date of publication A2:
26.07.2000 Bulletin 2000/30

(21) Application number: **00300311.8**

(22) Date of filing: **18.01.2000**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **22.01.1999 JP 1501099**
19.02.1999 JP 4192599
01.04.1999 JP 9534799
05.04.1999 JP 9748099
10.09.1999 JP 25746699
02.11.1999 JP 31270199

(60) Divisional application:
01101154.1

(71) Applicant: **KONICA CORPORATION**
Tokyo (JP)

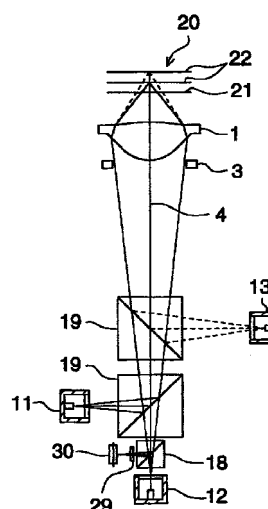
(72) Inventors:
• **Arai, Norikazu**
Hachioji-shi, Tokyo (JP)
• **Kojima, Toshiyuki**
Hachioji-shi, Tokyo (JP)
• **Kiriki, Toshihiko**
Hachioji-shi, Tokyo (JP)
• **Ota, Kohei**
Hachioji-shi, Tokyo (JP)
• **Saito, Shinichiro**
Hachioji-shi, Tokyo (JP)

(74) Representative:
Nicholls, Michael John
J.A. KEMP & CO.
14, South Square
Gray's Inn
London WC1R 5LX (GB)

(54) **Optical pickup apparatus and information recording/reproducing method**

(57) An optical pickup apparatus for reproducing information from an optical information recording medium (20) or for recording information onto an optical information recording medium (20), is provided with a first light source (11) for emitting first light flux having a first wavelength; a second light source (13) for emitting second light flux having a second wavelength, the first wavelength being different from the second wavelength; a converging optical system having an optical axis and a diffractive portion, and a photo detector (30); wherein in case that the first light flux passes through the diffractive portion to generate at least one diffracted ray, an amount of n-th ordered diffracted ray of the first light flux is greater than that of any other ordered diffracted ray of the first light flux, and in case that the second light flux passes through the diffractive portion to generate at least one diffracted ray, an amount of n-th ordered diffracted ray of the second light flux is greater than that of any other ordered diffracted ray of the second light flux, where n stands for an integer other than zero.

FIG. 48





European Patent
Office

PARTIAL EUROPEAN SEARCH REPORT

Application Number

which under Rule 45 of the European Patent Convention EP 00 30 0311 shall be considered, for the purposes of subsequent proceedings, as the European search report

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 5 526 338 A (HASMAN EREZ ET AL) 11 June 1996 (1996-06-11) * column 8, line 1-11; claim 1; figure 9A *	1,25,26, 43,44, 54,70, 71,135, 136	G11B7/135
A	---	23,24	
A	EP 0 747 893 A (NIPPON ELECTRIC CO) 11 December 1996 (1996-12-11) * page 7, line 16,17; figures 3B,5,,33 * * page 14 - page 15; claims 1,2 *	1	
A	US 5 696 749 A (KAY DAVID B ET AL) 9 December 1997 (1997-12-09) * column 2, line 9-16; figures 4,6 * * column 3, line 18,19; claim 1 *	1	
A	US 5 349 471 A (MORRIS G MICHAEL ET AL) 20 September 1994 (1994-09-20) * claim 1; figure 1 *	1	

	-/--		
TECHNICAL FIELDS SEARCHED (Int.Cl.7) G11B			
INCOMPLETE SEARCH The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC to such an extent that a meaningful search into the state of the art cannot be carried out, or can only be carried out partially, for these claims. Claims searched completely : Claims searched incompletely : Claims not searched : Reason for the limitation of the search: see sheet C			
Place of search		Date of completion of the search	Examiner
BERLIN		31 January 2001	Bernas, Y
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

EPO FORM 1503 03.82 (P04007)

PARTIAL EUROPEAN SEARCH REPORT

Application Number
EP 00 30 0311

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	EP 0 828 244 A (SAMSUNG ELECTRONICS CO LTD) 11 March 1998 (1998-03-11) * claim 1; figure 3 *	1	
A	US 5 703 856 A (HAYASHI HIDEKI ET AL) 30 December 1997 (1997-12-30) * claim 1; figure 5 *	1	
A	US 5 717 674 A (INOUE YASUAKI ET AL) 10 February 1998 (1998-02-10) * claims 1-3; figures 1-3 *	23,24	
A	PATENT ABSTRACTS OF JAPAN vol. 014, no. 462 (P-1113), 5 October 1990 (1990-10-05) & JP 02 183453 A (RICOH CO LTD), 18 July 1990 (1990-07-18) * abstract *	33-36	TECHNICAL FIELDS SEARCHED (Int.Cl.7)



European Patent
Office

Application Number

EP 00 30 0311

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- ☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- ☒ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
1-26, 33-37, 38, 43-50, 54, 55, 70-75, 135, 136
- ☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



European Patent
Office

**LACK OF UNITY OF INVENTION
SHEET B**

Application Number
EP 00 30 0311

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims: 1-22,25,26,37,38,43-50,54,55,135,136

Concerns an optical pickup apparatus for reproducing from or recording on an optical information recording medium, having several light sources of different wavelengths and a converging system including a diffractive portion having a greater diffraction power in one higher order. The apparatus being able to reproduce from or record on disks of different kinds

2. Claims: 23-24

The subject defined additionally specifies that the diffractive portion is designed in a way to satisfy particular diffraction power differences between orders, for the different wavelengths

3. Claims: 27-29

The subject defined additionally specifies the power series of the phase difference function of the diffracting portion of the converging element.

4. Claims: 30-32

The subject defined additionally specifies that the diffracting portion of the converging element has positive and negative diffracting portions.

5. Claims: 33-36

The subject defined additionally specifies that the diffraction portion is subdivided in a center and a peripheral zone and that the pitch in the center and peripheral zones of the diffracting portion of the converging element satisfy a specific parametric equation.

6. Claims: 39-42

The subject defined additionally specifies the dimensions and number of the annular bands of the diffracting portion of the converging element.

7. Claims: 51-52

The subject defined additionally specifies the maximum of the diffraction efficiency of the diffracting portion of the converging element at a certain wavelength

8. Claims: 56-57



European Patent
Office

**LACK OF UNITY OF INVENTION
SHEET B**

Application Number
EP 00 30 0311

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

The subject defined additionnaly specifies aperture limiting means to shade or diffract at least one of the various light fluxes

9. Claims: 70-75

The subject defined additionnaly specifies the arrangement of the photodetectors and/or light sources.



European Patent
Office

**INCOMPLETE SEARCH
SHEET C**

Application Number
EP 00 30 0311

Claim(s) searched completely:

1-22, 25, 26, 37, 38, 43-50, 54, 55, 135, 136

Claim(s) not searched:

53, 58-69, 76, 77-134

Reason for the limitation of the search:

In view of the large number and also the wording of the claims presently on file, which render it difficult, if not impossible, to determine the matter for which protection is sought, the present application fails to comply with the clarity and conciseness requirements of Article 84 EPC (see also Rule 29(5) EPC) to such an extent that a meaningful search is impossible.

Consequently, the search has been limited and no search has been done on claims 53, 58-69 and 76, neither on claims 77-134 concerning the optical element alone.

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 00 30 0311

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

31-01-2001

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5526338 A	11-06-1996	EP 0731459 A	11-09-1996
		IL 117057 A	15-07-1998
		JP 8339571 A	24-12-1996
EP 0747893 A	11-12-1996	JP 2713257 B	16-02-1998
		JP 9054977 A	25-02-1997
		JP 2725653 B	11-03-1998
		JP 9073654 A	18-03-1997
		JP 3047351 B	29-05-2000
		JP 9054973 A	25-02-1997
		US 5696750 A	09-12-1997
US 5696749 A	09-12-1997	NONE	
US 5349471 A	20-09-1994	NONE	
EP 0828244 A	11-03-1998	CN 1279471 A	10-01-2001
		CN 1186300 A	01-07-1998
		DE 69701552 D	04-05-2000
		DE 69701552 T	07-09-2000
		JP 11353699 A	24-12-1999
		JP 10092010 A	10-04-1998
US 5703856 A	30-12-1997	JP 8055363 A	27-02-1996
		US 5912868 A	15-06-1999
US 5717674 A	10-02-1998	JP 9073017 A	18-03-1997
		JP 9073651 A	18-03-1997
JP 02183453 A	18-07-1990	JP 2672618 B	05-11-1997